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In This Issue: **Designing Organizations for Value**

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Specific Knowledge and Divisional Performance Measurement

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Performance measurement is one of the critical factors that determine how individuals in an organization behave. Performance measurement includes subjective as well as objective assessments of the performance of both individuals and subunits of an organization such as divisions or departments. Besides the choice of the performance measures themselves, performance evaluation involves the process of attaching value weights to the different measures to represent the importance of achievement on each dimension.

A company's performance measurement and evaluation system is one of the three important aspects of organizational design that we refer to collectively as the organizational "rules of the game." The other two are the reward and punishment system—including nonmonetary rewards and promotions as well as salary changes and bonuses—and the system for assigning "decision rights" to individuals in an organization. By "decision rights," we mean the rights to decide on and take an action.[1]

These three aspects of the rules of the game are obviously related. If the performance measures are to have the desired effects on the behavior of an organization's members, the reward and punishment system must link rewards with performance in a clear and consistent way. Furthermore, the performance measures should also be consistent with the ways in which decision rights are allocated throughout an organization. For example, it is less important—and may even be counterproductive—to measure the efficiency with which a manager employs plant and equipment using return on assets (as opposed to, say, total dollars of profits) if the manager does not influence decisions to invest in plant and equipment and there is nothing he or she can do to offset the effect that asset decisions have on performance.

In this paper, we examine five common divisional perfor-

mance measurement methods—cost centers, revenue centers, profit centers, investment centers, and expense centers—and furnish the outlines of a theory that attempts to explain when each of these five methods is likely to be the most efficient. As discussed below, the central insight of our theory is that each of these methods can be seen as providing an alternative way of aligning corporate decision-making authority with valuable "specific knowledge" inside the organization. Stated as briefly as possible, our theory suggests that cost and revenue centers work best in cases where headquarters has (or can readily obtain) good information about cost and demand functions, product quality, and investment opportunities. Decentralized profit and investment centers will tend to supplant revenue and cost centers when the managers of business units have a significant informational advantage over headquarters.

Specific and General Knowledge

Perhaps the most important consideration in designing a performance measurement system is the cost of acquiring and transferring knowledge among decision agents—that is, managers and employees. We define specific knowledge as knowledge that is costly to transfer among agents and that is not easily observable by other agents (particularly, by managers higher in the organization's hierarchy). General knowledge is information that is transferable among agents at low cost or is easily observable by other agents.[2]

Idiosyncratic knowledge about people, machines, organizations, customers, and suppliers, as well as knowledge of time and place, are all examples of specific knowledge. Such knowledge is difficult or impossible to aggregate—and information about time and place is by its very nature destroyed by the process of aggregation. Specific knowledge is also often obtained at low cost by individuals in an organization as a byproduct of other activities—for example, the idiosyn-

1. This includes not only sole and complete control over a given decision, but a range of possibilities for influencing the decision. In large organizations, it is common for no single person to have all the decision rights necessary to undertake a major project. Instead, there is a complex process that brings many people into the decision-making function, a process that breaks the simple notion of a decision right into many components that are allocated to various decision agents. A common breakdown of such components is as follows: (1)

initiation rights—the right to initiate resource allocation proposals; (2) notification rights—the right to be notified of the actions or proposed actions of others and the right to provide information or recommendations about those proposals; (3) ratification rights—the right to review and ratify or veto the resource allocation recommendations of others; (4) implementation rights—the right to implement the ratified proposals; and (5) monitoring rights—the right to monitor the implementation of ratified proposals, including the rights to measure and evaluate performance and to determine rewards and punishments. For a discussion of initiation, ratification, implementation, and monitoring rights, and how their assignment can reduce agency costs, see Eugene Fama and Michael Jensen, "Separation of Ownership and Control," *Journal of Law and Economics* 26 (June 1983).

2. The terms specific and general knowledge are used to characterize the two ends of a continuum that measures the cost of transferring knowledge between agents. **>>**

cratic knowledge about a machine that its operator gains over time. In contrast, prices and quantities are examples of general knowledge that is easily aggregated and inexpensive to transmit among agents.

Achieving effective use of information in decision-making is a major problem in organizations. The literature in computers and information systems views the problem as one of finding ways to transfer knowledge relevant to a decision to the agents involved in the decision. This makes sense when the knowledge is general, or when the problem is one of discovering new technology (for example, in computing or communications) that will effectively convert specific to general knowledge. But when the relevant knowledge is specific and when technology is unable to lower the cost of transfer substantially, this approach will fail.

The alternative to moving the knowledge is to move the decision rights to those agents who possess the relevant specific knowledge. Although this will sometimes mean greater coordination, or centralization, of decision-making (for example, in the case of an industry-consolidating merger), in the majority of cases the transfer of decision rights is likely to be away from headquarters—that is, a decentralization of decision-making. But even though decentralization has the potential to improve decision-making, it is not without costs of its own. The costs incurred are those that arise from the potential conflict between the private interests of managers and employees and the goals of the organization. As the decision rights are transferred to managers and employees at lower levels in the organization, such agents are likely to use the decision rights in ways that benefit themselves at the expense of the performance of the organization. This potential conflict of interest makes it necessary to devote resources to controlling the costs associated with the inconsistent objectives of agents in the organization—what have come to be called "agency costs."

The concept of agency costs, as we defined it in our 1976 paper in the *Journal of Financial Economics*, include the following: the costs of devising and enforcing contracts with agents; the costs of monitoring the agents' behavior; the bonding costs incurred by the agent to help assure the principal that he or she will not engage in opportunistic behavior; and, finally, the "residual loss"—that is, the reduction in firm value resulting from the reality that it is not cost-effective (if indeed possible at all) to define and enforce contracts perfectly. This residual loss arises because it pays companies to incur additional monitoring, bonding, and

contracting costs only to the point where the improvements in the decision process just pay for themselves. Thus, not all counterproductive behavior is eliminated.

Alternative Divisional Performance Measures

There are five major categories of performance measurement systems: (1) cost centers, (2) revenue centers, (3) profit centers, (4) investment centers, and (5) expense centers. We briefly discuss each of these measurement systems and then turn to an analysis of the conditions under which each will tend to be an efficient system.

Cost Centers

Cost centers are designed to encourage managers to focus on increasing the efficiency of the production process without the distractions caused by changes in demand conditions that would affect them if revenues were included in the performance measure. But, as we argue below, cost centers are likely to be effective only in certain, fairly restrictive, circumstances.

There are three alternative ways to define the objective for a manager whose performance measurement and evaluation system is set up as a cost center:

1. Minimize costs for given output.
2. Maximize output for given total cost.
3. Minimize average costs (with no quantity constraint).

Rules 1 and 2 are logically equivalent and, provided management chooses the right level of output or the optimal total cost constraint, they are both consistent with maximizing the value of the firm. Rule 3, however, is logically inconsistent with maximizing the value of the firm because it motivates the cost center manager to achieve a level of output that minimizes average cost. And, as illustrated in Figure 1, that level of output will not be the value-maximizing level except by accident.

Figure 1 illustrates the point for a manufacturing division with a standard U-shaped average cost function that is evaluated as a cost center. The figure portrays two alternative optimal output levels, Q^*_L, and Q^*_H, for two alternative sets of demand conditions ("L" denoting low demand and "H" denoting high demand). Since minimum average cost occurs at output level Q, *regardless of whether demand for the product is high or low, that is where the divisional manager will choose to operate*. The manager will produce more than the optimal level of output when demand is low, and too little output

Figure 1   **Desired Output of Manager Evaluated as a Cost Center with No Quantity Constraint***
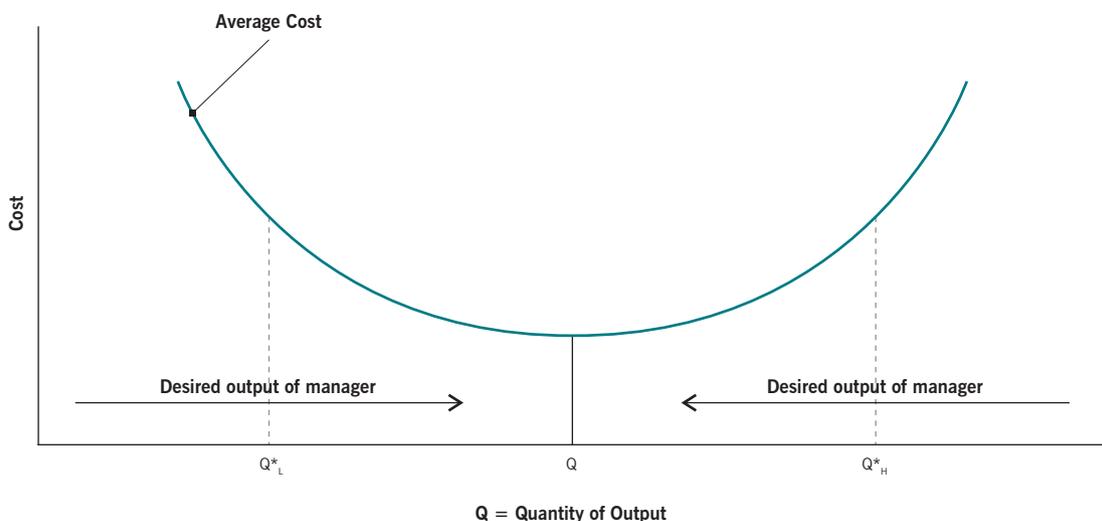
Q$_L$ and Q*$_H$ are two alternative optimal outputs.

when demand is high. And the company as a whole will sacrifice the profits that could have been earned from operating at the optimal level of output.

Moreover, even if the division manager does not have the rights to set the output level unilaterally but has input into the decision, he will tend, other things being equal, to provide a constant source of pressure to move the planned output level closer to Q, the minimum average cost output level. In the situation where optimal output is higher than the minimum average cost point, the manager will tend to take actions that reduce output unexpectedly—for example, claiming machine breakdowns or labor or material shortages (that could have been avoided with better planning). And, if it is difficult for those at higher levels in the hierarchy to distinguish the reasons for these events (because the information required to do so is specific and located in the manufacturing division), it will be difficult to eliminate these counterproductive effects from the system as long as the manufacturing division is a cost center.

Good knowledge of the minimum obtainable cost functions would allow the evaluation mechanism to adjust for differences in quantity of output and therefore eliminate the problems associated with incentives to game the system— at least on the quantity dimension. With such knowledge, the evaluation system would measure performance as deviations from the minimum obtainable cost function. In practice, however, knowledge of the cost functions will in general be unavailable or very costly. Standard cost systems are at best a crude attempt to control for the effects of quantity changes. And further reducing their usefulness in such situations,

they make the correct adjustments only when marginal cost is constant—a condition that is unlikely to hold for large changes in output either up or down.

In addition to higher-level uncertainty about optimal quantity and standard costs, another potential problem with cost centers is that a cost center manager has incentives to reduce quality below the optimal level—because that too reduces measured cost. This incentive the system provides to lower quality means that cost centers will tend to work well only when it is inexpensive to ascertain quality as well as the optimal quantity and quality, and how "true" standard costs vary with output. Moreover, for some functions, the measurement of quantity is as difficult as the measurement of quality. Consider, for example, the computer services supplied by a centralized service bureau in a firm. There is no simple, unique (or non-arbitrary) way to measure quantity in such a multi-dimensional environment.

And there is another potential limitation of cost centers. If a division produces different products, the product mix decision will pose serious difficulties in this structure because the relative amounts of each product to be produced must be determined outside of the division and given to the cost center manager as a constraint to be met. This is another example of the need to control the quantity decision for a cost center manager.

As stated earlier, the general principle in assigning decision rights is to attempt to "co-locate" the decision rights with the relevant specific knowledge. The cost center manager is typically given decision rights over the choice of factor inputs, operating procedures, technology, and so on, all of which

generally require a great deal of knowledge that is specific to the local situation. The advantages of this system, when it can be implemented, come from the specialization it encourages. As we noted above, the cost center manager can focus on increasing the efficiency of the production process without the distractions caused by changes in demand conditions.

In sum, *cost centers will tend to be the most efficient performance measurement system when the optimal quantity, quality, and product mix decisions can confidently be made outside the division.* But, when it is difficult to measure quantity and quality, and when the knowledge required to make the optimal quantity, quality, and product mix decisions is specific and inaccessible to those higher in the hierarchy, it will be difficult to operate the division as a cost center. In such cases, as discussed later, profit or investment centers are likely to work better.

Revenue Centers

Revenue centers are the logical complement to cost centers. Revenue centers have essentially the same advantages as cost centers—the greater focus and inducement to specialization associated with greater controllability. But they also have similar problems, and thus limitations on their effectiveness, stemming from lack of specific knowledge at headquarters.

Although the main performance measure in such centers is total revenue, the objective can take one of three logical forms:

1. Maximize total revenues for a given price.
2. Maximize total revenues for a given quantity of unit sales.
3. Maximize total revenues (with no quantity constraint).

Again, the first two of these options are logically the same and, given the correct choice of price or quantity, they are both consistent with maximizing the value of the firm. But, as we saw in the case of cost centers, the revenue center managers cannot be allowed to determine the quantity or they will simply go to the quantity where revenue is maximized—that is, the point where marginal revenue is zero. As long as marginal costs are positive, this will exceed the profit-maximizing quantity.

The product mix decision is a particular problem in revenue centers because of the tendency for the performance measure to become total revenues from *all* products. If so, other things equal, the manager will substitute sales efforts from lower-priced to higher-priced products; and, unless the profit margins (including the associated capital costs) are the same for all products, the higher revenue from such substitution will come at the expense of overall profits. In this situation, a better performance measure is *gross margin*, defined as the dollar difference between total revenues and total variable costs (including a capital charge).

The advantage of the revenue center is that the manager can specialize in the marketing and sales effort without concern for the factors that influence production cost. To do so the manager will generally be given decision rights over marketing and sales issues that require considerable specific knowledge (available only at the local level), but not the right to decide on quantity or product mix. This means that, *when the knowledge required to make the quantity and product mix decision is available at low cost at higher levels in the hierarchy, the revenue center structure will tend to be efficient.*

Profit Centers

A divisional profit center is evaluated on the difference between its revenues and costs as defined by the measurement system. Although "profit center" refers to a performance measurement system, it is also widely used to describe a divisional structure in which the profit center manager is given a broader set of decision rights. But this, of course, does not prevent profits from being used as a measure of performance in divisions run by managers with limited decision rights. We use the term here to describe a system in which a division's performance is measured by its profits.

When the knowledge required to make decisions about the product mix, quantity, and quality is specific to the division and therefore costly or impossible for managers at higher levels in the hierarchy to obtain, the profit center can be an effective performance measurement system. In these cases it is desirable to use profits as a performance measure while giving profit center managers decision rights over factors such as the product mix, quantity, and quality.

Nevertheless, the profit center structure also has potentially serious problems of its own. It is well known that maximization of profits for each division does not lead to maximum profits for the firm as a whole, except in the special circumstance in which there are no interdependencies between divisions. Such interdependencies can take the form of:

• Interfirm transactions in which one or more divisions buys the product of another, and therefore the price paid by the buying division affects its costs and pricing decisions (the "transfer pricing" problem);[3]

• Interdependent demands (e.g., Pontiac and Oldsmobile, or film and cameras), where demand for one or more of the firm's products depends on the policies for the other products (e.g., pricing, quality, or technology); or

• Interdependent supply or cost functions, where the cost

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3. See J. Hirschleifer, "Internal Pricing and Decentralized Decisions," in *Management Controls: New Directions in Basic Research*, ed. C.P. Bonini, H.M. Wagner (New York: McGraw-Hill, 1964).

of producing a product depends on the production decisions for other products (e.g., gasoline and kerosene, since more gasoline production means less kerosene obtained from a barrel of crude oil).

When interdependencies among centers are significant, profit center performance measurement can lead to seriously suboptimal behavior on the part of divisional managers.

One solution to the first kind of interdependencies—interfirm transactions that give rise to the transfer pricing problem—is for corporate headquarters to set a transfer price that is equal to the marginal cost of the producing division at the optimal quantity of output. But this requires top management to know both the revenue and cost functions in detail (in order to determine the optimal output level in each period and the marginal cost at the optimal output level). If the information necessary to know both revenue and cost functions is specific to the operating divisions, it will be difficult for top management to set the optimal transfer price. On the other hand, if close substitutes for the good being traded internally are also traded in outside competitive markets, the outside market price is a likely candidate for the optimal transfer price. But even in such cases, if there are important synergies in the form of shared costs or benefits among different profit centers, the optimal transfer price could deviate significantly from the market price.

In short, there is no simple solution to the problems caused by interdependencies in demand or cost functions.[4] If these interdependencies are significant and there is no simple way to coordinate the actions of the two divisions, one possible solution is to merge them into a single division and then apply the profit measure to the sum of the two divisions rather than to either separately. Another possibility is to evaluate and reward division managers based in part on the performance of "related" business units as well as the performance of their own division.

Investment Centers and EVA

Investment centers are a variation on the profit center structure in which the manager is evaluated on some measure that relates profits to the assets (and underlying capital) used to generate them. As such, investment centers are performance measurement systems that take into account the efficiency of asset utilization.

Investment centers are likely to be most effective when managers of the division have the specific knowledge required to decide the optimal level of investment, when they are given (or acquire) decision rights over investment and asset levels, and when the costs associated with suboptimal asset utiliza-

tion are likely to be large. U.S. companies have commonly taken asset utilization into account by using rate-of-return measures such as return on assets (ROA) or return on equity (ROE). But, as we argue below, both of these measures are highly susceptible to gaming and tend to provide counterproductive incentives when managers have decision rights over the level of investment or assets.

Again, as we saw in the case of cost centers and revenue centers, the objective function for an investment center can take one of three forms:

1. Maximize the percentage return on assets for given total assets.

2. Maximize total assets for given total percentage return.

3. Maximize total percentage return on assets (with no constraint on total assets).

Forms 1 and 2 can be consistent with maximizing the value of the firm if the constraints on total assets or total percentage return are chosen correctly, and this can work if top management has the relevant specific knowledge to set the correct constraints. However, a common form for this objective function to take is the unconstrained Form 3, and this is inconsistent with maximizing the value of the firm. A manager evaluated on maximizing the total percentage return on assets has an incentive to reduce assets to the point where the firm owns no assets other than the single asset with the highest return. This, of course, is not consistent with maximizing value or wealth. A 100% return on $1,000 of assets is $1,000, while a 30% return on $100,000 of assets is $30,000.

Economic Value Added, or EVA for short,[5] is an alternative single-period performance measure that eliminates this incentive for underinvestment. EVA is defined as net cash flow in a period less a capital charge equal to the cost of capital times the dollar value of the assets employed in the business. This "residual income," as it used to be known in the accounting literature, has none of the disadvantages mentioned above of ROA or ROE. Because it is total *dollars* of net cash inflow less the total dollar charges for capital used in the business, EVA is an appropriate number to maximize. EVA also has the advantage of revealing to managers the real cost of capital used in a business. Because accounting statements reflect the cost of debt, but not the cost of equity, used in a business, managers often think and behave as if equity has no cost. EVA accounting statements show a loss when net cash flows are not sufficient to cover the full cost of an organization's capital.

But EVA is not a panacea. Like all single-period, or flow, measures of performance, EVA fails to solve what we call

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4. See Hirshleifer (1964).

5. For a detailed description of EVA and its uses, see G.B. Stewart, *The Quest for Value: A Guide for Senior Managers* (New York: Harper Business, 1991). See also the next article in this issue, Al Ehrbar and Bennett Stewart, "The EVA Revolution."

Figure 2   **The Firm Value Maximizing Level of Output, Q*, for an Internal Service Center Organized as an Expense Center and the Center's Optimal Output Level, Q**

Q = Quantity of Output
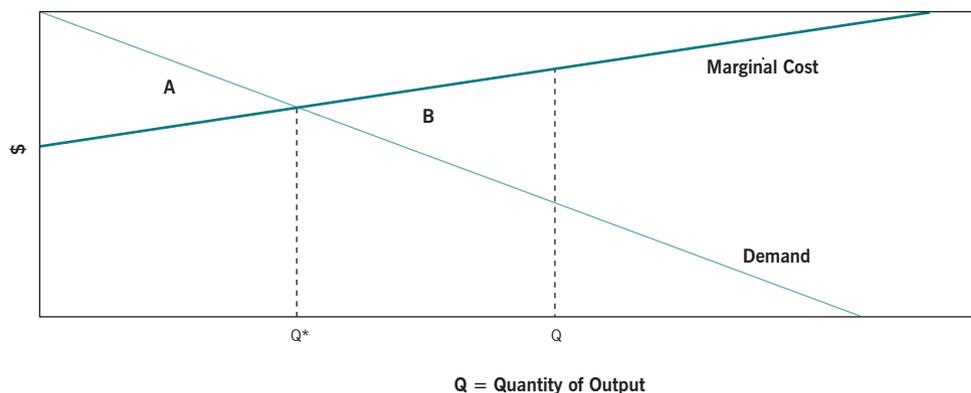
the "capital value" problem.[6] This problem arises for projects where early years' EVA is negative, but the future annual EVA of a project is sufficiently large to justify the investment on a net present value basis. Managers evaluated solely on the basis of the current year's EVA will not take such projects. In these cases, market value—or the discounted present value of net cash flows less the investment required to generate them—is the appropriate value to maximize.

Thus, while EVA is the best flow measure of performance currently known, it is not the universal answer to the search for the perfect performance measure. Perfect measures of capitalized value will never be found because value cannot be known with certainty until *after* a project has run its course to completion and shutdown.

Expense Centers

Expense centers are the private equivalent of the classic public bureaucracy.[7] A division organized as an expense center generally produces services for the rest of the organization, and the consuming units are not charged for the services they consume. The providers of internal administrative services such as human resources, patent management, and public relations are commonly organized as expense centers.

Consider a division that negotiates a budget allocation from a central budget office at the beginning of each year and simultaneously makes a commitment to the quantity of services that will be provided. Figure 2 portrays the demand for the division's services from the rest of the organization. This curve plots the marginal value to the organization as a whole of the division's output at various levels. (For simplicity, we assume the service is produced with no fixed costs and marginal costs given by the schedule in Figure 2.)

The profit-maximizing output level, Q*, is the point where the marginal production cost of the service equals the demand price (which is the marginal benefit to the organization of an additional unit of the good or service). A potential problem with this system, however, is that if the manager of the expense center in Figure 2 is motivated to maximize the size of the division (if only because compensation schedules tend to increase rewards for jobs with larger budgets and more people), the equilibrium output level will be significantly higher than Q*, as indicated by the point "Q" in Figure 2. (For simplicity the figure assumes that the relevant measure of size in the objective function of the divisional manager is the quantity of output.)

The point Q is determined under the assumption that the budget office can estimate reasonably well the value to the entire organization of the division's *total* output, but has limited knowledge of the costs and benefits of individual units of output. This means the budget office will not authorize a budget for the division that exceeds the division's total value to the organization. Q will thus be the maximum quantity that can be produced by the division subject to the constraints that (1) its total budget does not exceed the total value of its output to the organization (the area under the demand curve) and (2) its total cost of producing the output (the area under the MC curve assuming no fixed per-period costs) does not exceed its budget.

6. Stern Stewart & Co., the firm directly responsible for refining the residual income measure into EVA, attempts to address this capital value problem by establishing a "bonus bank" system that ties current bonus payments to a kind of rolling three-year average payout of previous years' bonus awards. But, although this effectively extends managers' performance horizon from one to three years, this does not completely solve the problem. Significant amounts of (publicly traded) stock in the entity managed can accomplish this, but this of course is often not cost-effective.

7. See W.A. Niskanen, Jr., "The Peculiar Economics of Bureaucracy," *American Economic Review* 58 (May 1968).

(This is the quantity for which the area of triangle A equals the area of triangle B.)

Based on this analysis, the incentives of an expense center manager can thus be summarized as follows: The manager of the center wants to produce as much as possible, and the total value (ignoring the cost) of the center to the organization rises as the promised output rises. Therefore the budget increases with increases in the promised level of output. The result is that the budgets and output of expense centers tend to become larger than the size that would maximize the value of the organization. But there is a limit to such growth because the manager cannot produce more than Q with the maximum total budget the budget office is willing to give him for that promised level of output. And, in this fashion, this promised level becomes the equilibrium output.

Internal Chargeback Systems: Decentralizing Part of The Control Function

The tendency of an expense center to overproduce is exacerbated by the fact that the consumers of the center's product are not charged for the services they consume. Therefore, consumers have no incentives to compare the cost of the services they consume with the value of the services to them. In addition, if the budget office attempts to cut the center's budget, the center will be able to obtain support from the consumers of its output to oppose such cuts. The center director reacts to budget cuts by threatening cuts in the most highly valued rather than the marginal services and this also motivates the center's users to lobby against such cuts. The fact that the users of the service do not pay for the output they consume also means they will tend to demand services of too high a quality.

Consider a situation where the knowledge required to evaluate the performance of a division that provides services or product to other units of an organization is (1) specific (that is, costly to transfer among agents), (2) not easily observable from higher levels in the hierarchy, and (3) located among users of the division's output. In this situation it can be desirable to transfer some of the control function to the users of the division. This can be done by instituting a charge system in which the users pay for the output of the producing division. When consumers must pay for a good or service rather than receiving it at no cost, they have incentives to compare the benefits of the goods with the prices they must pay for them. This will cause them to consume less of the goods or services, thereby reducing the overconsumption problem caused by the expense center structure.

If a chargeback system is to be effective as a decentralized control mechanism, the users must also have decision rights that give them effective choices—for example, the right to purchase the good outside the firm, to produce it themselves, or to buy it from another division that has gone into competition to produce and supply the good internally. Given these decision rights, a buying division has incentives to compare the quality and prices of the goods offered by the supplying division to that which they can obtain from other suppliers or by making it themselves. This constant evaluation will then be reflected in the buyer's decision to purchase or not to purchase from the supplying division. This right to choose to buy elsewhere provides strong incentives for the buying division to monitor the hard-to-assess qualities of the product of the supplying division, and it will be able to use its specific knowledge of those qualities in its monitoring.

In such a system, the higher levels in the hierarchy have effectively delegated much of the monitoring of the supplying division to its customers. This in turn means that the overall divisional monitoring function can be accomplished at higher levels in the hierarchy simply by measuring the profits of the producing division. In so doing, headquarters is freed from much of the task of monitoring the quality and quantity of output.

Internal chargeback systems can be used not only for expense centers, but with any of the performance measurement methods thus far described. In each case, there are benefits to be obtained by soliciting the help of the buyers of the division's output in the monitoring function. But there is at least one potentially important obstacle to implementing such chargeback systems—namely, the possession of "monopoly" power by the selling division or "monopsony" power by the buying division. Selling division managers who have monopoly powers within the organization will charge prices that are too high, while buying divisions with monopsony power could force sellers to furnish the product or service at prices that are too low. In either case, the resulting output of the organization will be less than the optimal level. For this reason, chargeback systems will be more efficient when neither the sellers or buyers have internal monopoly powers.

Choice of Performance Measure

The choice of a performance measure requires a theory that predicts when one performance measure will provide more reliable incentives to maximize value than another. Our goal here is the construction of a theory of the determinants of performance measurement that enables one to predict when a division will be organized as a profit center, cost center, investment center, revenue center, or expense center.

The decision to operate a division as an expense center is in large part a decision to control and monitor the division directly from higher in the hierarchy. This centralized control and monitoring option will be more attractive when it is easier to evaluate the performance of the division from higher levels of the hierarchy, and when it is difficult to decentralize the monitoring function to users of the output of the division. For example, it is sometimes difficult to identify a set of users who could be charged for the output of the unit. Such users must be individuals or business units whose combined valua-

The Locus of Uncertainty Problem

Unfortunately, there are pressures inside companies that tend to exacerbate the monopoly problem while at the same time substantially reducing incentives for users to make effective use of their specific knowledge about the quality and quantity of the output of the producing division. One source of such pressure is what we have labeled the "locus of uncertainty" problem.

Organizations that institute chargeback systems as part of a decentralized control mechanism commonly inhibit the functioning of those systems by constraining the choices of the customers of the internal seller through such devices as line budgets or "funny money" allocations that cannot be spent on anything other than the good or service in question. Computer services are a good example. It is common for computer funds in the budgets of buyers of a centralized internal computer supplier to be constrained for use in purchases from the central facility only. Since the funds allocated in such line budgets have zero opportunity cost to the managers, the managers' purchase decisions do not reflect their assessment of the value of the service relative to other uses of the funds. This means the purchasing decisions of users do not reflect their evaluation of the quality and quantity of the services supplied by the central facility in comparison to that available from alternative suppliers or from their own production of the service. Thus, one of the major benefits from introduction of a chargeback system, the revelation of such specific knowledge possessed by users, is lost to the organization.

In every situation in which a chargeback system is used, there is an individual (whom we will call the "budget officer") who must bear a good deal of uncertainty in order for the organization to receive the benefits of the chargeback system. This is the person responsible for the budgets of both the selling and buying divisions. The problem arises from the fact that, at the beginning of the year, the same monies allocated to the selling division for use in the production of the service must also be allocated to the buying divisions. If the buying divisions choose to spend the resources on goods and services other than those forecast by the selling division for its product, the monies will have in effect been spent twice and the budget officer will experience a deficit.

If the evaluation mechanism faced by the budget officer is not flexible enough to allow for such deficits, the budget officer has incentives to collaborate with the supplying division to make the latter an effective monopoly by forbidding the expenditure of funds allocated for its product on anything else. This is accomplished by line budget allocations. Such constraints destroy much of the benefits of the chargeback system—indeed, they make it a sham.[8] Under what circumstances, then, does the use of line budgets make sense? The centralized restriction of choices through line budgets is likely to be efficient mainly when problems in measuring the performance of users make it difficult to ensure that users are generally reflecting the value of the good to the entire organization in their decisions. In practice, however, such restrictions are also widely used when there is no benefit to the organization and when they generate considerable costs.

In many cases, it is the CFO or Controller of the organization who is the budget officer, and who therefore faces the locus of uncertainty problem generated when he or she is faced with allocating a given amount of money twice. Doing so requires risking the possibility that the budget will be overspent when buying division managers reject the overpriced or low-quality services of the selling division. There is no simple solution to this problem. The top management of the company must simply recognize that, in order to get the benefits of a chargeback system, the company must be prepared to run the risk of overspent budgets.

Of course, budget overruns can cause problems for security analysts, who are mostly interested in having their forecasts proved correct. In this case capital markets can drive CFOs and their companies to forgo the benefits of a decentralized monitoring system for the false security of a more certain, but far less efficient, management-by-the-numbers" system. To the extent division managers have better information about their businesses than headquarters, performance evaluation systems that put primary emphasis on meeting budgeted targets lead to "sandbagging" and other forms of "gaming" in the budget-setting process, and this in turn leads to even more inefficiencies and waste.

8. For a case dealing with the locus of uncertainty problem, see G.P. Baker and K.B. Monsler, "San Francisco Bay Consulting," Case no. 9-195-196, Harvard Business School Publishing, 1995.

tion of the center's output is likely to equal the value to the organization as a whole.

Take the case of the patent services group in a large pharmaceutical company. If the scientists in the lab are given the decision rights over when to use patent services and are charged for them, the organization will likely consume too little of the service. On the other hand, because of the significant time lag—often as much as ten years—between

a patent-and-disclosure decision and the outcome of that decision, it would also be a mistake to give the decision rights to the manufacturing or marketing divisions. The managers of these units are unlikely to have the scientific expertise to keep up with the multitude of developments in the lab and to foresee the commercial applicability of that subset which should be protected with patents or disclosure. They will tend to focus their attention instead on the struggle to contain the usual day-to-day emergencies in the firm's current markets.

In short, it will be difficult in many organizations to decentralize the monitoring of such services. In these situations, the major alternative is to organize the supply of such services as an expense center and monitor its performance directly. It will tend to have all the problems of expense centers, but the costs of these problems might nevertheless be the lowest attainable among all alternative organizational structures.

In general, a cost center will be more desirable the lower is the cost of obtaining good information about:

- quantity;
- quality;
- correct output mix; and
- cost functions.

Profit centers will tend to be more desirable when the above costs are high and when:

- the correct revenues for the division are relatively easy to identify;

- there are few interdependencies in cost and demand functions between divisions; and
- there are no major internal monopoly problems.

In cases of business units that provide product or services mainly to other units inside the firm, profit centers will tend to work best when they are combined with a decision rights assignment that decentralizes part of the monitoring function of the center to its customers through a chargeback system. It is important, however, that such chargeback systems give those customers effective alternatives and thereby provide potential or actual competition for the profit center.

Investment centers and EVA will tend to be more desirable when the activity is capital-intensive and when it is difficult to identify optimal divisional asset investments from higher in the hierarchy.

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